TENNESSEE DEPARTMENT OF EDUCATION
FIRST TO THE TOP

Cardiovascular Services

Primary Career Cluster:	Health Science
Consultant:	Sheila Carlton, (615) 532-2839, sheila.carlton@tn.gov
Course Code(s):	TBD
Prerequisite(s):	*Diagnostic Medicine* and *Anatomy and Physiology*
Credit:	1
Grade Level:	11-12
Graduation Requirement Substitution:	None
Programs of Study and Sequence:	This is the fourth course in *Diagnostic Medicine* program of study
Necessary Equipment:	None
Aligned Student Organization(s):	HOSA: http://www.tennesseehosa.org Amanda Hodges, (615) 532-6270, Amanda.Hodges@tn.gov
Coordinating Work-Based Learning:	If the student wishes to qualify to take the Certified Cardiographic Technician (CCT) exam upon graduation from high school, a clinical component is required. The teacher must have completed work-based learning training to offer the students the opportunity for placement in Job Shadowing or Clinical Internship. For more information, please visit http://www.tn.gov/education/cte/wb/.
Available Student Industry Certifications:	Certified Cardiogenic Technician (CCT) after graduation
Dual Credit or Dual Enrollment Opportunities:	There are no known dual credit/dual enrollment opportunities for this course. If interested in developing, reach out to a local postsecondary institution to establish an articulation agreement.
Teacher Endorsement(s):	577
Required Teacher Certifications/Training:	None
Teacher Resources:	http://www.tn.gov/education/cte/HealthScience.shtml

Course Description

The health-related profession of cardiovascular science is concerned specifically with the diagnosis and treatment of patients with cardiac and peripheral vascular disease. *Cardiovascular Services* is the fourth-

level applied course in the *Diagnostic Services* program of study intended to prepare students with an understanding of the roles and responsibilities of those seeking employment in the cardiovascular field of healthcare. Upon completion of this course, students will be proficient in the anatomy and physiology of the heart and knowledgeable about both invasive and non-invasive cardiovascular procedures. Students will incorporate communication, goal setting, and information collection skills to be successful in the workplace. Students who complete a clinical internship in addition to this course will be eligible upon graduation to sit for the Certified Cardiographic Technician (CCT) exam; relevant standards are indicated below with (CCT). Standards in this course are aligned with Common Core English Language Arts & Literacy in Technical Subjects as well as Tennessee Anatomy and Physiology standards.*

Program of Study Application

This is the fourth course in the *Diagnostic Services* program of study. For more information on the benefits and requirements of implementing this program in full, please visit the Health Science website at http://www.tn.gov/education/cte/HealthScience.shtml.

Course Standards

Career Planning

1) Research careers within cardiovascular sciences and explain in a graphic illustration or informational artifact** the educational/credentialing requirements, scope of practice, as well as state and national compliance guidelines required of cardiovascular health care professionals. (TN CCSS Reading 2, 7, 9)

2) Analyze the range of skills, competencies, and professional traits (such as leadership, time management, and ethical responsibility) required for careers in cardiovascular sciences. Using real-time and projected labor market data, identify local and national employment opportunities and determine areas of growth. Complete a job application, resume, and cover letter for one of the jobs located in the search. (TN CCSS Reading 2; TN CCSS Writing 4, 6, 8, 9)

Legalities and Ethical Issues

3) Summarize the Health Insurance Portability and Accountability Act (HIPAA) and explain procedure and guidelines concerning receiving and verifying physician orders, identifying the patient/client, and obtaining patient's consent to perform procedures. Identify the procedures that require written permission and those that require only verbal consent. Role-play these procedures in a classroom and/or clinical setting. Explain, using domain-specific language and accurate definitions of legal concepts, how the content of these legal documents impacts patients' rights for all aspects of care. (TN CCSS Reading 1, 2, 4, 5)

4) Compare and contrast the costs of preventive medical procedures versus diagnostic medical procedures related to the cardiovascular system. Use information found in news media, professional journals, and trade magazines to help determine if preventive procedures would increase or decrease health care cost as it relates to heart health. (TN CCSS Reading 1, 9; TN CCSS Writing 2, 8, 9)

Anatomy and Physiology

5) Outline the gross and cellular structure and function of cardiac, circulatory, pulmonary, and autonomic systems. Include the following areas:
    a. Electrophysiology of the heart, including definitions of waveforms
    b. Control mechanisms and cardiac cycle with normal values (CCT)
    c. Size, location, layers, chambers, valves, pressures, and blood flow of heart (CCT)
    d. Relationship of cardiac output to heart rate and stroke volume (CCT)

    (TN A&P 1, 3, 4)

6) Interpret the pathophysiology related to normal and abnormal heart sounds. Evaluate simulated heart sounds to identify normal heart sounds, murmurs, rubs, and extra heart sounds via a mannequin or digital substitute. (TN CCSS Reading 3; TN A&P 1, 3, 4)

7) Choose a disease, disorder, or emergency situation related to the cardiac, circulatory, pulmonary, or autonomic systems drawn from news media, textbooks, professional journals, or trade magazines. Develop an oral or visual presentation interpreting the scope of the disease/disorder/emergency, basic pathophysiology, affected populations, pharmacological interventions, signs and symptoms, risk factors, existing practices that target the disease/disorder, and interventions available. (TN CCSS Reading 1, 2; TN CCSS Writing 2, 8, 9; TN A&P 1, 3, 4)

8) Formulate a written and digital health education project to inform an adult and/or geriatric audience about the negative effects of complications such as electrolyte imbalance, obesity, hypertension, diabetes, or renal impairment on the heart and circulatory systems. (TN CCSS Reading 2; TN CCSS Writing 6, 8)

Diagnostics and Procedures

9) Perform the following duties and tasks related to pre-procedural activity: (CCT)
    a. Perform universal precautions (e.g., hand washing, Personal Protective Equipment)
    b. Transport the patient
    c. Prepare the patient (shaving, cleaning skin, etc., should be simulated on mannequin)
    d. Collect patient information
    e. Enter information into Electrocardiogram (ECG) machine
    f. Identify proper landmarks on mannequin
    g. Maintain patient safety throughout the pre-procedural process.

    (TN CCSS Reading 3)

10) Differentiate between bipolar, unipolar, and precordial leads. Relate their importance in performing an ECG test correctly. Include the concept of Einthoven's Triangle in the explanation. (TN CCSS Reading 1, 2, 3, 5)

11) Compare and contrast the single- and three-channel ECG machines. Demonstrate the ability to define the purpose of the equipment, and explain indications for use, expected outcomes, advantages, disadvantages, and limitations of each. (TN CCSS Reading 1, 2, 3, 5)

12) Summarize the history of the ECG machine including aspects of industry standardization and advances in technology. Use a timeline or other graphic to illustrate the major developments. (TN CCSS Reading 2, 7; TN CCSS Writing 6, 8)

13) Understand principles of and successfully perform skills related to performing a resting ECG (12 lead, 15 lead, etc.), incorporating rubrics from textbooks or clinical standards of practice for the following: (CCT)
    a. Gather supplies and equipment
    b. Educate patient on procedure expectations
    c. Apply electrodes and leads to patient
    d. Confirm equipment
    e. Perform standard ECG

    (TN CCSS Reading 1, 3, 5)

14) Obtain ECG tracing strips and perform rhythm analysis, including the following: (CCT)
    a. Analyze ECG tracing for presence of P, Q, R, S, and T waves, heart rate calculation, and axis determination and implications.
    b. Identify ECG tracings indicative of sinus, junctional, atrial, ventricular, atriaventricular, hypertrophy, chamber enlargement, and pacemaker rhythms. Include intraventricular conduction and myocardial perfusion tracings.
    c. Identify electrical interference and somatic tremor on an ECG tracing, as well as the steps to take to alleviate or prevent such artifacts.
    d. Correlate ECG finding (wavelengths, segments, intervals, etc.) with cardiac function.
    e. Correlate ECG morphology with anatomy and physiology.

    (TN CCSS Reading 1, 3, 5, 7)

15) Role-play explanation of the cardiovascular reflex test in a mock clinical setting. Discuss at minimum the following: overview or explanation of the test, the associated risks, patient expectations before, during, and after the test, and next steps for abnormal results. (TN CCSS Reading 1, 2)

16) Summarize in a written, oral, or digital presentation the scope of a typical electrocardiograph test. Draw evidence from textbooks, professional journals, and online healthcare sites (such as Cleveland Clinic, MedLine Plus, and Mayo Clinic) to produce an overview or explanation of the test, the associated risks, and patient expectations before, during, and after testing. (TN CCSS Reading 1, 2; TN CCSS Writing 2, 4, 6, 8, 9)

17) Construct a chart or a graph that differentiates between the various types of nuclear imaging and the radiographic cardiovascular test. Include within this graph or chart an overview or explanation of the test, the mechanics of the procedure, the associated risks, and patient expectations before, during and after testing. Obtain information from textbooks, professional journals, and online healthcare sites (such as Cleveland Clinic, MedLine Plus, and Mayo Clinic). (TN CCSS Reading 1, 2; TN CCSS Writing 2, 4, 6, 8, 9)

18) Research the types of invasive diagnostic procedures. Examples might include cardiac catherization, carotid angiography, electrophysiological studies, intravascular ultrasound, or myocardial biopsy. Develop a patient education packet utilizing medical and non-medical terminology, including the following information: overview or explanation of the procedure, the

associated risks, patient expectations before, during, and after the test, and next steps for abnormal results. (TN CCSS Reading 1, 2; TN CCSS Writing 2, 4, 6, 7, 8, 9)

19) Differentiate between the various types of cardiovascular ultrasound procedures. Discuss what an ultrasound can identify that other procedures might not, in addition to the risk considerations, reliability of results, and proper interpretation of an ultrasound image. Role-play teaching another classmate about the type of procedure that has been ordered by the physician. (TN CCSS Reading 1, 2; TN CCSS Writing 2, 4, 6, 8, 9)

Invasive Treatment Procedures

20) Research treatments involving cardiac, vascular, and thoracic surgery for cardiovascular and pulmonary diseases and/or disorders. Analyze in written, oral, or digital format the implications for each, identifying trends and/or advances in available treatments over the past fifty years. (TN CCSS Reading 1, 2, 4; TN CCSS Writing 2, 6, 8, 9)

21) Identify characteristics and/or signs and symptoms of patients experiencing cardiac complications in physician offices or emergency rooms. Create a plan of action for assessment, diagnosis, and treatment of the patient. (TN CCSS Reading 1, 3; TN CCSS Writing 2, 8, 9)

Health Statistics

22) The Centers for Disease Control (CDC) suggests that the number one leading cause of deaths in the United States is heart disease, according to 2012 data. Complete a short research project to identify on the local level the 1) incidence of heart disease and disorders, 2) number of associated deaths, 3) preventive measures currently being taken, and 4) available educational programs and initiatives. Document findings in an oral, digital, or visual presentation. Information can be found from organizations such as the CDC, state and county health department websites, and interviews with public health and emergency professionals. (TN CCSS Reading 1, 2, 7; TN CCSS Writing 2, 6, 7)

23) Research the Healthy People Initiative sponsored by the U.S. Food and Drug Administration (FDA). Identify the goals and objectives, established baselines, and strategies to facilitate progress toward the initiative's goals. Then, develop a marketing campaign to inform a variety of audiences about the initiative. The campaign can include a public service announcement, community awareness project, health education project, and/or public health education project shared with local schools, leaders in the community, and the general public. (TN CCSS Reading 1, 2, 7, 9; TN CCSS Writing 2, 6, 8, 9)

Standards Alignment Notes

*References to other standards include:

- TN CCSS Reading: Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects; Reading Standards for Literacy in Science and Technical Subjects 6-12; Grades 11-12 Students (page 62).
    - Note: While not directly aligned to one specific standard, students who are engaging in activities outlined above should be able to also demonstrate fluency in Standard 10 at the conclusion of the course. Teachers are encouraged to develop extension activities to cover standards 6 and 8.
- TN CCSS Writing: Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects; Writing Standards for Literacy in History/Social Studies, Science, and Technical Subjects 6-12; Grades 11-12 Students (pages 64-66).
    - Note: While not directly aligned to one specific standard, students who are engaging in activities outlined above should be able to also demonstrate fluency in Standards 3, 5 and 10 at the conclusion of the course. Teachers are encouraged to develop extension activities to cover standard 1.
- Tennessee Science: Anatomy and Physiology

Additional Notes

**Informational artifacts include but are not limited to brochures, posters, fact sheets, narratives, essays, and presentations. Graphic illustrations include but are not limited to charts, rubrics, drawings, and models.